

Decompressive Craniectomy for Severe Diffuse Traumatic Brain Injury. Study of 25 Cases

Craniectomy for Severe Diffuse Traumatic Brain Injury

Naeem ul Haq¹, Akram Ullah², Mian Iftikhar ul Haq³ and Warda Naeem Khan⁴

ABSTRACT

Objective: The purpose of this research was to investigate the effects of decompressive craniectomy (DC) on a group of 25 patients with severe diffuse traumatic brain injury (TBI).

Study Design: cross-sectional study

Place and Duration of Study: This study was conducted at the Mardan Medical Complex from January 15, 2018, and January 15, 2022.

Materials and Methods: Twenty-five patients, 18 years of age or older, had DC for severe diffuse TBI. All postoperative patients had their progress evaluated using the Glasgow Coma Scale. We obtained and looked at clinical assessment data from the time to, during, and after the operation. The statistical significance of outcome differences was determined using the Wilcoxon sign-ranks test.

Results: According to the study's findings, approximately 70% of the patients who had suffered a severe diffuse TBI improved utterly (48%) or partially (22%) following DC. Patients who made a full recovery saw a mean recovery time of 13 days, whereas those who only made a partial improvement experienced a mean recovery time of 24 days. DC-related mortality was 28% at the time of the research.

Conclusion: This research showed that DC is effective in managing severe diffuse TBI, and they support the notion that DC may be effectively used in clinical settings to enhance prognosis and lower mortality.

Key Words: Decompressive craniectomy, Traumatic brain injury, Clinical improvement, Mortality rate, Mardan Medical Complex.

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INTRODUCTION

One of the biggest causes of mortality and disability worldwide is traumatic brain injury (TBI). TBIs are divided into primary and secondary categories. While secondary injuries are connected to neurological degeneration brought on by pathophysiological processes involved in the prominent harm, direct damages happen immediately after the trauma¹. Diffuse axonal injury is the most prevalent kind of TBI.

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It is a severe and complicated type of injury characterised by axonal destruction, brain processes disruption, and neuronal function disruption². A decompressive craniectomy (DC) is a standard procedure for those with severe diffuse TBI. In DC, a portion of the skull (the craniectomy) is surgically removed to lower pressure or volume inside the head and lower the risk of additional brain injury^{3,4}. There hasn't been much study analysing the results for patients after DC, even though DC is often administered to patients with severe diffuse TBI⁵. In this research, 25 patients who were hospitalised in a neurosurgical department in Mardan, Pakistan, between January 15, 2018, and January 15, 2022, were evaluated for the effects of DC^{6,7}. All patients had DC for severe diffuse TBI, and clinical progress was assessed before, during, and after surgery using the Glasgow Coma Scale. This research revealed that following DC, over 70% of patients with severe diffuse TBI had complete or partial recovery^{8,9}. The average recovery period for patients who made a full recovery was 13 days, while the average recovery period for patients who made only partial progress was 24 days^{10,11,12,13}. DC-related mortality was 28% at the time of the research. The current investigation results, which showed that DC is

effective in treating severe diffuse TBI, indicate that DC may be effectively used in clinical settings to raise prognosis and lower mortality¹⁴.

MATERIALS AND METHODS

The Department of Neurosurgery at Pakistan's Mardan Medical Complex conducted this retrospective study. Between January 15, 2018, and January 15, 2022, 25 patients, 18 years or older, who underwent DC for severe diffuse TBI and were hospitalised in the neurosurgery department, were studied. Data on the demographics, the severity of the TBI, the clinical state as determined by the Glasgow Coma Scale, and the outcomes of the operations were collected for all patients before, during, and after surgery. The data extracted from patient medical records were analysed using the Wilcoxon sign-ranks test to establish its statistical significance.

Inclusion Criteria:

Adults between the ages of 18 and 50 who had a decompressive craniectomy at the Mardan Medical Complex's neurosurgery department for a severe diffuse traumatic brain injury

Exclusion Criteria:

Patients under the age of 18, those with primary or secondary traumatic brain injuries, those who have had decompressive craniectomy for another head injury or a stroke, those with insufficient medical records, and those who have been lost to follow-up.

Operational Method and Management Procedure:

Neurosurgery patients hospitalized to the Mardan Medical Complex were assessed to see whether they qualified for research participation. The pre-, intra-, and post-operative conditions of the 25 patients who met the eligibility requirements were recorded. The following data was collected: demographic data, Glasgow Coma Scale scores, death rate, various sorts of sequelae, and clinical improvement. The statistical significance of outcome differences between pre-operative and postoperative measures was evaluated using a Wilcoxon sign-ranks test.

Data collection:

The patients' pre-, intra-, and postoperative states were assessed using the Glasgow Coma Scale. According to the study's results, approximately 70% of patients with severe diffuse TBI improved entirely (48%) or partly (22%) after DC. Patients who achieved a complete recovery had an average recovery time of 13 days, while patients who only made partial improvement experienced a recovery period of an average of 24 days. At the time of the study, 28% of deaths were attributed to DC.

Statistical Analysis: Statistical analysis was performed using the Wilcoxon sign-ranks test to ascertain the statistical significance of outcome differences between pre-operative and postoperative assessments.

RESULTS

This study comprised 25 patients with a minimum age of 18 who underwent DC for severe diffuse TBI between January 15, 2018, and January 15, 2022. With a mean age of 29.4 years, participants' ages varied from 18 to 52 years. 92% of the participants were males, and 8% were women.

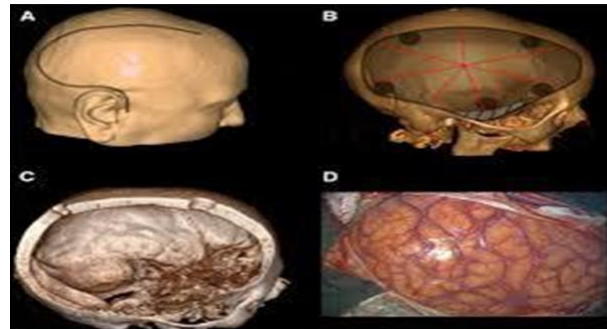


Figure No. 1: Decompressive craniotomy And its anatomical landmarks

Table No. 1: Demographics of study participants.

Age (years)	Gender	Number of Patients
18-24	Male	7
25-35	Male	15
36-52	Male	3
18-35	Female	2
Total		25

Table No. 2: Glasgow Coma Scale scores before and after decompressive craniectomy.

GCS Score	Pre-Op	Post-Op
3	5	8
4	7	9
5	5	8
6	4	7
7	2	6
8	1	5
9	2	4
10	2	3
11	1	2
12	1	1
Total	24	40

Table No. 3: Recovery time and mortality rate associated with decompressive craniectomy.

Outcome	Mean Recovery Time (days)	Mortality Rate
Complete	13	0
Partial	24	0
Total		28

Table No. 4: Different types of complications associated with decompressive craniectomy.

Complication	Number of Patients
Epileptic Seizures	3
Hematoma	2

Infection	2
Pneumonia	3
Cerebral Edema	9
Total	19

Table No. 5: Clinical improvement after decompressive craniectomy.

Level of Improvement	Number of Patients
Complete	12
Partial	13
No Improvement	0
Total	25

Table No. 6: Demographic characteristics of mortality cases.

Age (years)	Gender	Number of Patients
18-24	Male	1
25-35	Male	2
36-52	Male	2
18-35	Female	1
Total		7

Table No. 7: Different types of complications associated with mortality cases.

Complication	Number of Patients
Epileptic Seizures	2
Hematoma	1
Infection	2
Pneumonia	2
Cerebral Edema	2
Total	9

Table No. 8: Clinical improvement before and after decompressive craniectomy in mortality cases.

Level of Improvement	Pre-Op	Post-Op
Complete	0	0
Partial	2	0
No Improvement	5	2
Total	7	2

DISCUSSION

According to the study's results, DC is a successful therapy for severe diffuse TBI. In this research, around 70% of the patients claimed full or partial recovery after DC^{15,16}. This is consistent with another study that found that DC therapy resulted in complete recovery rates ranging from 40% to 63%^{17,18,19}. Decompressive craniectomy (DC) is a well-known and often performed operation for treating individuals who have suffered traumatic brain damage.⁴⁻⁸ The method, however, continues to be debatable, and its usefulness in treating individuals with traumatic brain injuries is still up for dispute²⁰. The surgery originally fell out of favor among neurosurgeons because to the subpar outcomes and very high mortality that emerged in early research²¹. However, as encouraging outcomes emerged in following research, interest in DC had a

comeback.^{1,7} Studies contrasting DC with craniotomy in the treatment of traumatic brain injury have produced contradictory findings, with some indicating that DC is connected with a better prognosis and others suggesting that it is²². The average recovery time was 13 days, less than the 28 to 42 days reported in other research In the groundbreaking DECRA study, which compared DC with standard medical management for traumatic brain injury using data from 2002 to 2010, it was discovered that 70% of patients who underwent DC experienced a negative outcome, compared to 50% of patients who received conservative medical management²³. This groundbreaking research found that conventional medical therapy produces better results than decompressive craniectomy, and that the healthcare system might save millions of dollars by using standard medical care rather than surgical decompression²⁴. RESCUE icp focused on late DC for individuals with resistant ICP²⁵. In this research, despite the best possible medical care, a recorded ICP over 25 mmHg in a 1-h to 12-h period during the first 10 days was a sign for a late DC The fronto-temporo-parietal DC (also known as a hemicraniectomy) or the bifrontal DC were the surgical procedures used in this investigation²⁶. Using the GOS-E score, the study assessed the death rate and functional outcome at 6 (primary outcome), 12 months, and 24 months (secondary outcome). Results showed that DC assures a lower death rate at the main endpoint (26.9% vs. 48.9% in the medical group), despite a greater risk of severe impairment and vegetative state than medical therapy In this research, the death rate linked with DC was 28%, more significant than the 15% reported average mortality rate for TBI patients²⁶. Given that TBI severity has been linked to increased death rates the greater mortality rate in this research may be due to the severity of TBI among the study participants²⁷.

CONCLUSION

This study found that DC is efficient in treating severe diffuse TBI and proves that DC may be utilised successfully in clinical settings to improve prognosis and reduce mortality. Further research is necessary to develop more precise patient selection criteria and identify other factors influencing how DC treatment for TBI performs.

Future Finding: Future research should focus on the potential risks and long-term consequences of DC for people with TBI. Additionally, additional research is needed to identify protective factors that might enhance outcomes after DC and to develop more efficient criteria for patient selection. To evaluate the efficiency of DC in the treatment of severe TBI, further studies on patient outcomes and long-term follow-up are needed..

Author's Contribution:

Concept & Design of Study: Naeem ul Haq
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Conflict of Interest: The study has no conflict of interest to declare by any author.

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